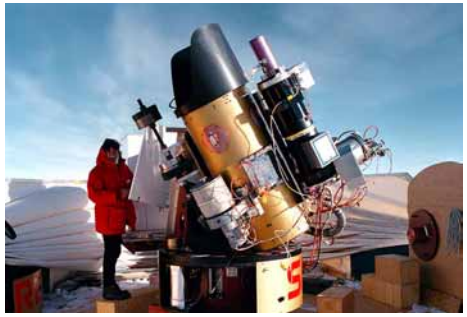
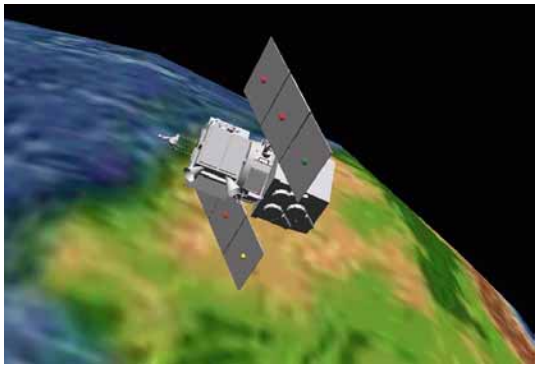
Instrument Remote Control





Advanced Architectures and Automation Branch (588)

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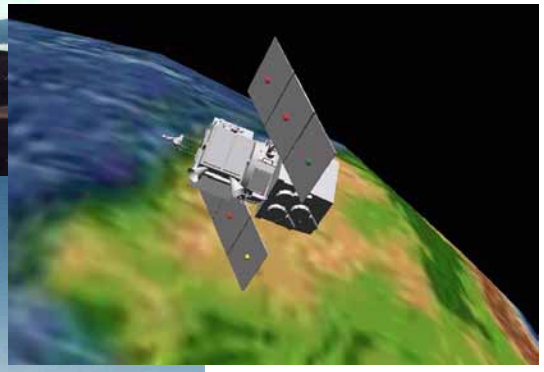
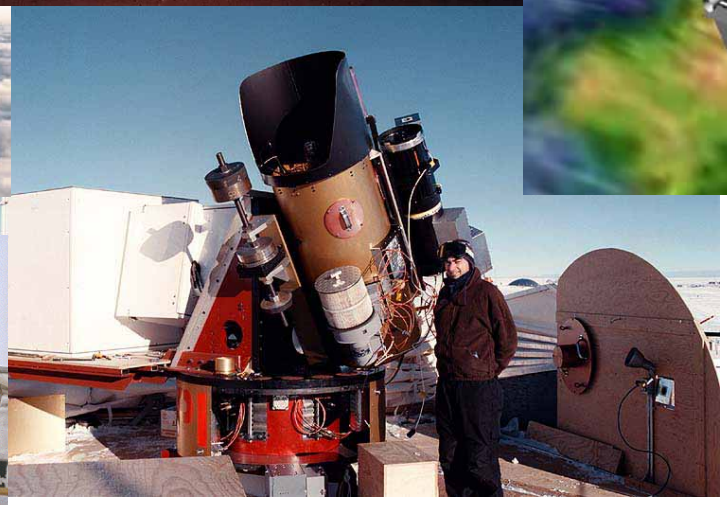
Instrument Remote Control

Adaptive framework from science investigator to instrument that provides configuration, control, monitoring, data analysis, and simulation for the complete instrument lifecycle.

Airborne



Space-based



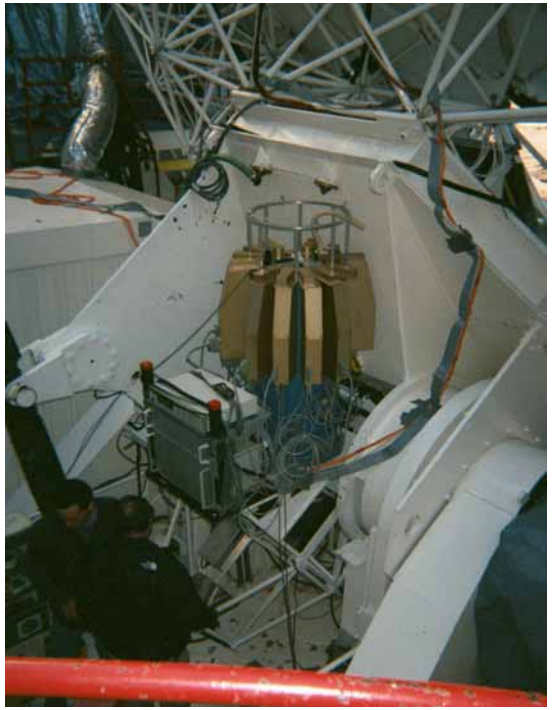
Ground

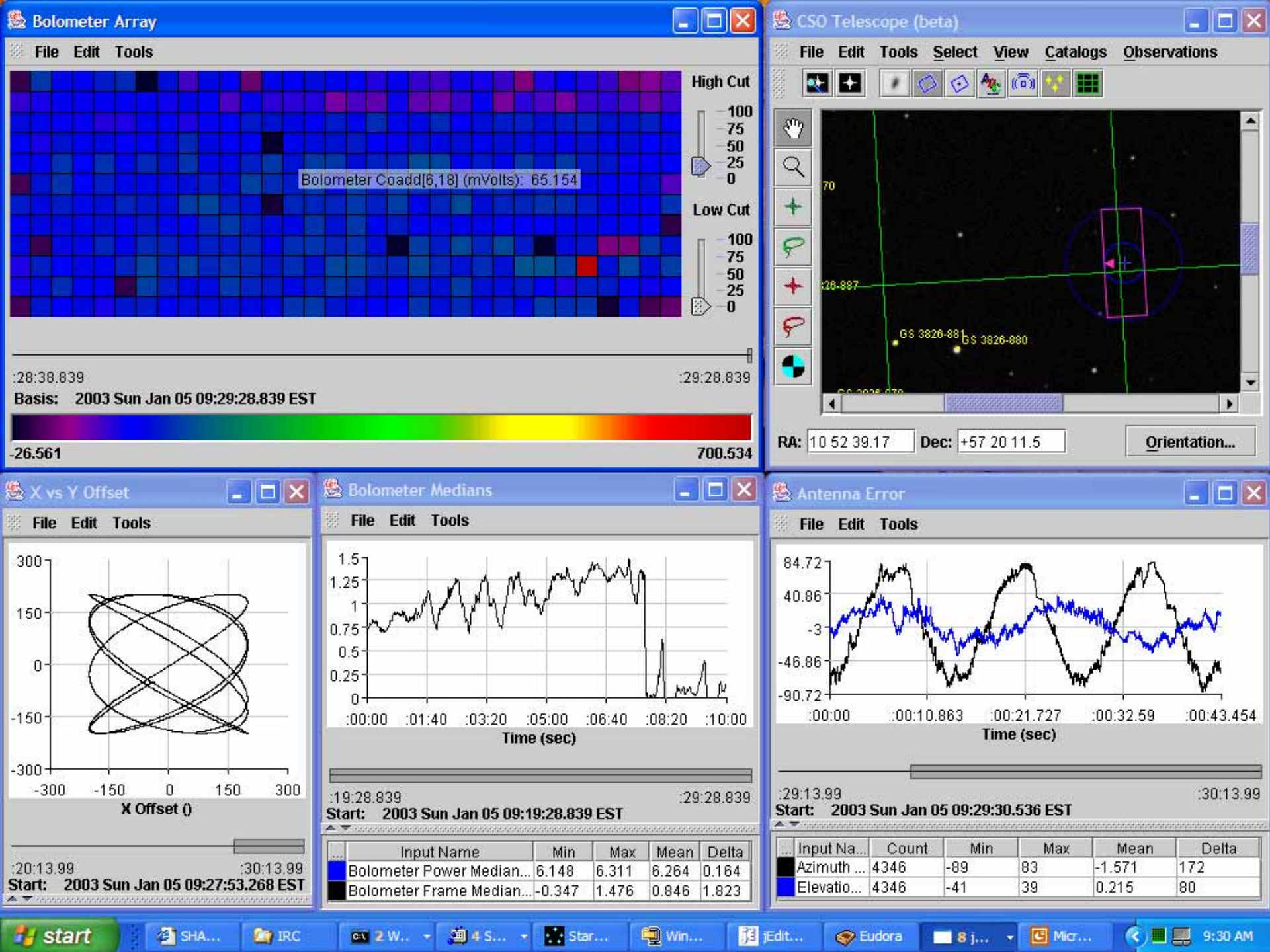
What is IRC?

- Extensible Framework
  - Object-oriented collection of packages and components that can be dynamically configured.
  - Java Technology used for cross-platform portability
  - XML Technology used to describe custom configurations and instrument interfaces. In many cases no additional coding is needed to interface to new hardware.
  - Capability to plug-in new technology to support fault detection, automation, data analysis, etc.
  - Supports distributed architecture
- Reduced cost/time for instrument software development
  - Facilitates prototyping and incremental development
  - Plug-in component technology
  - Scripting
- Increase cross-instrument reuse
  - Framework components reused on several instruments with very little instrument specific code needed.

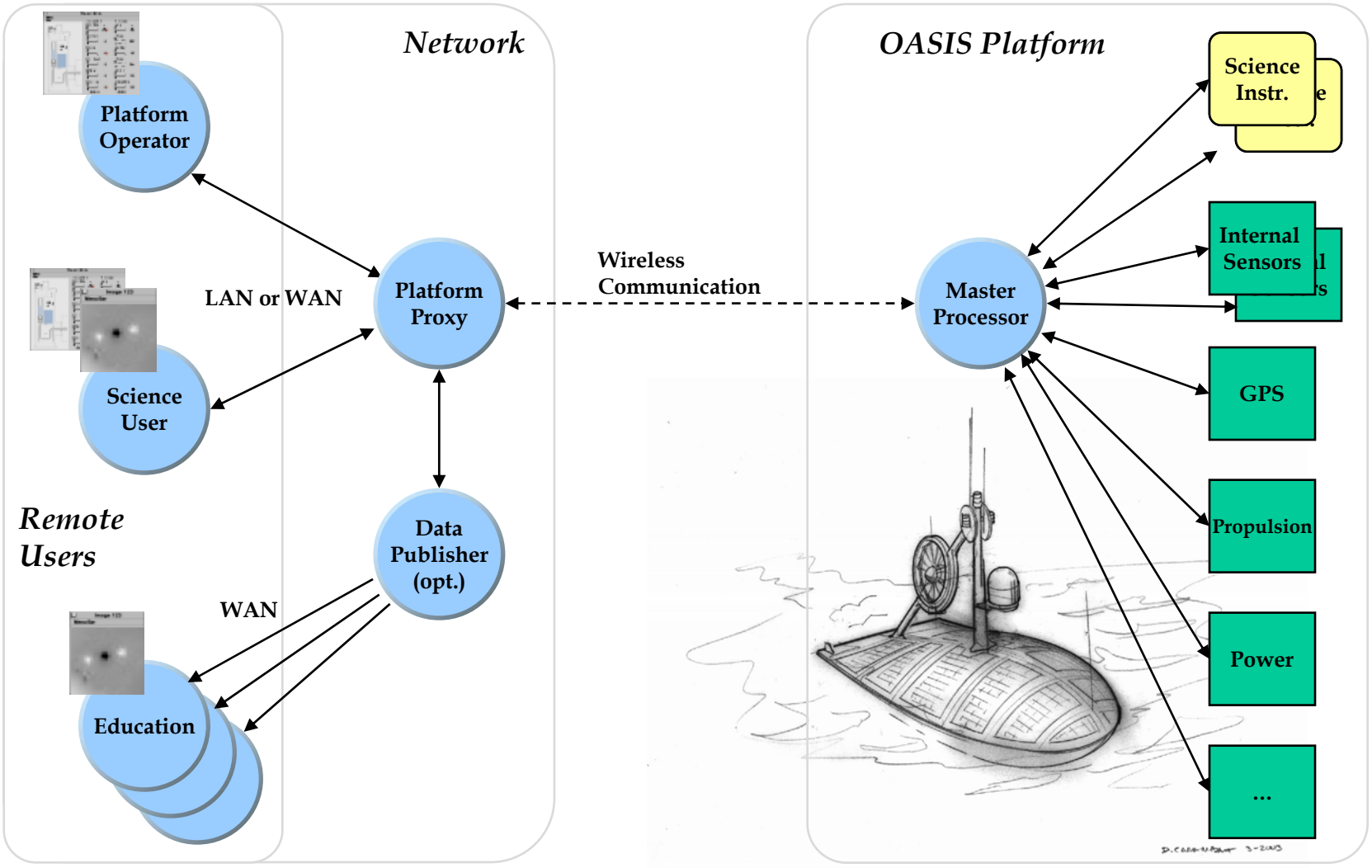
Current Customers

- Instruments
  - HAWC - High-resolution Airborne Wideband Camera (U of Chicago, GSFC)
  - SAFIRE - Submillimeter And Far Infrared Experiment (GSFC)
  - FIBRE - Fabry-Perot Interferometer Bolometer Research Experiment (GSFC)
  - SHARC - Submillimeter High Angular Resolution Camera (Caltech)
  - OASIS - Ocean-Atmosphere Sensor Integration System (NOAA, GSFC)
- Organizations
  - Infrared Astrophysics Branch (685)
  - University of Chicago
  - Caltech
  - Laboratory for Hydrospheric Processes (970)
  - Earth Science Technology Office
  - Stratospheric Observatory for Infrared Astronomy (SOFIA)
  - National Institute of Standards and Technology

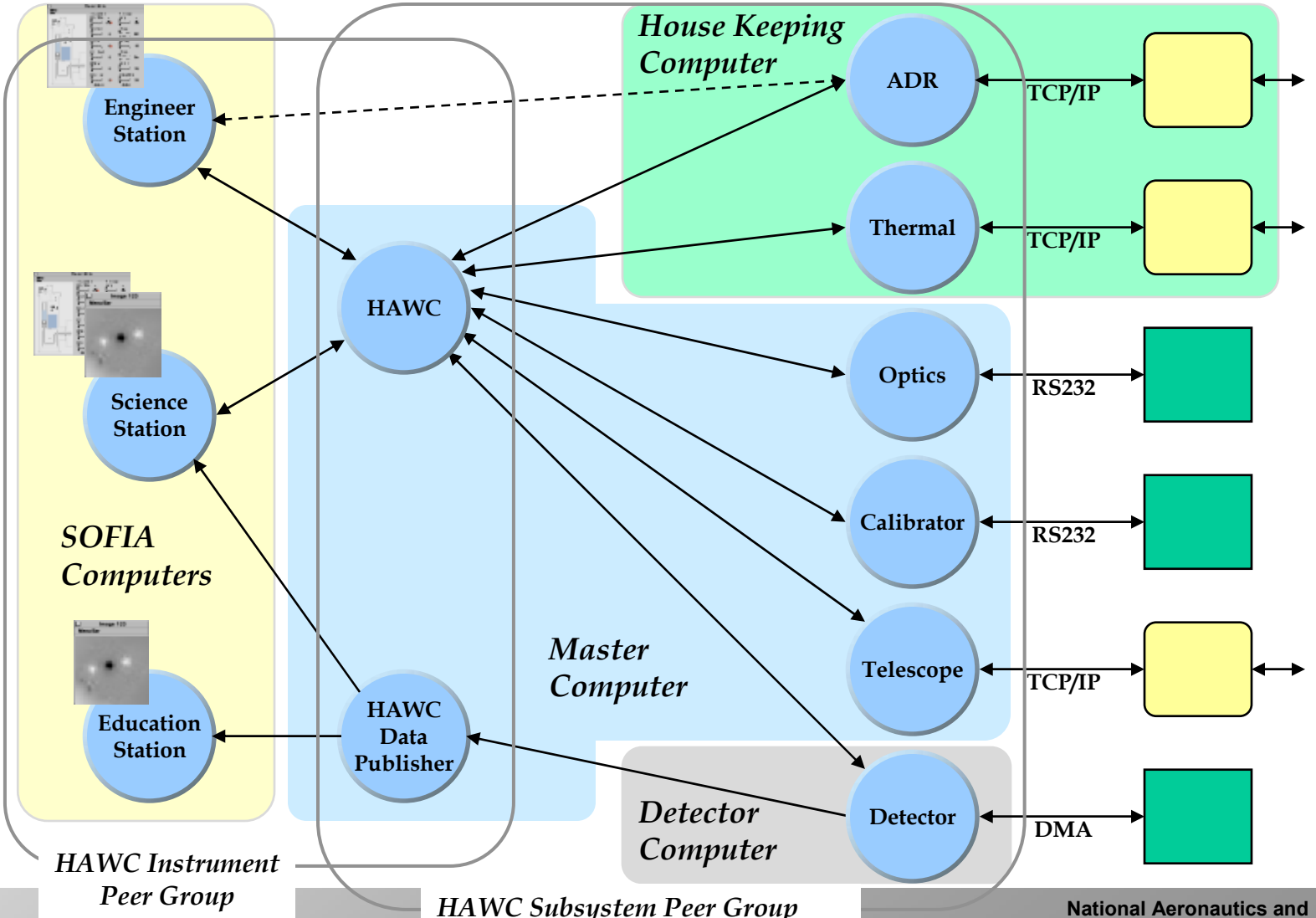



Bolometer Array
File Edit Tools
High Cut
100
75
50
25
0
Low Cut
100
75
50
25
0
Bolometer Coadd[6,18] (mVolts): 65.154
:28:38.839
:29:28.839
Basis: 2003 Sun Jan 05 09:29:28.839 EST
-26.561
700.534
CSO Telescope (beta)
File Edit Tools Select View Catalogs Observations
GS 3826-881
GS 3826-880
RA: 10 52 39.17
Dec: +57 20 11.5
Orientation...
X vs Y Offset
File Edit Tools
300
150
0
-150
-300
-300 -150 0 150 300
X Offset ()
:20:13.99
:30:13.99
Start: 2003 Sun Jan 05 09:27:53.268 EST
Bolometer Medians
File Edit Tools
1.5
1.25
1
0.75
0.5
0.25
0
:00:00 :01:40 :03:20 :05:00 :06:40 :08:20 :10:00
Time (sec)
:19:28.839
:29:28.839
Start: 2003 Sun Jan 05 09:19:28.839 EST
Input Name | Min | Max | Mean | Delta
Bolometer Power Median... | 6.148 | 6.311 | 6.264 | 0.164
Bolometer Frame Median... | -0.347 | 1.476 | 0.846 | 1.823
Antenna Error
File Edit Tools
84.72
40.86
-3
-46.86
-90.72
:00:00 :00:10.863 :00:21.727 :00:32.59 :00:43.454
Time (sec)
:29:13.99
:30:13.99
Start: 2003 Sun Jan 05 09:29:30.536 EST
Input Na... | Count | Min | Max | Mean | Delta
Azimuth ... | 4346 | -89 | 83 | -1.571 | 172
Elevatio... | 4346 | -41 | 39 | 0.215 | 80
start
SHA...
IRC
2 W...
4 S...
Star...
Win...
jEdit...
Eudora
8 j...
Micr...
9:30 AM

OASIS IRC Device Architecture



HAWC IRC Device Architecture



Role of IRC in Instrument Lifecycle

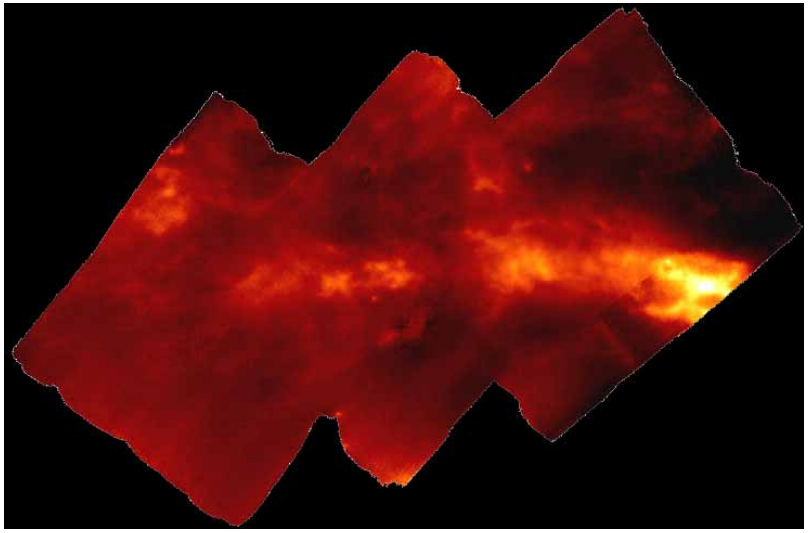
- Design/Development
  - Prototype and evaluate design options
  - Simulation of subsystems
  - Control and integration of hardware and software
- Test (Bench test through I&T)
  - Control instrument and lab test equipment
  - Flexible and dynamic configuration for specific lab environments or tests
  - Simulate missing components
  - Automate test procedures and analysis
- Operations
  - Control instrument and environment
  - Quick look and post data processing
  - Automate operational procedures

Instrument Markup Language

- Extensible Markup Language (XML) dialect to describe instrument characteristics
  - Instrument subsystems
  - Logical command set
  - Command arguments
    - Includes data types, valid values/ranges, and units
  - Command formats
  - Logical data streams (e.g., science data, housekeeping, command responses)
  - Data field types
    - Includes data types, valid values/ranges, and units
  - Data formats
  - Communication mechanisms
  - Documentation

IRC Status

- Completing Version 6 of the framework
  - An extensive redesign and implementation of the framework based on lessons learned
  - GUI customization via XML
- Transitioning current customers to Version 6
- Extending the library of plug-in components including technologies that will provide new capabilities or increase efficiency of operations.
- Extending the configurability of the framework using XML
- Enhancing the framework based on customer needs



Galactic Center image taken by the SHARC instrument using IRC.